

Lessons Learned in Nutrient Criteria Development in Virginia

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Nutrient Criteria Development Plan

- **Water Body Specific (Estuary, Lakes & Reservoirs, Rivers & Streams)**
- **Three separate rulemakings (2002 -2010)**
- **Preferred approach is effects based criteria for designated uses**
- **Involvement from Academic Advisory Committee, Stakeholders, Ad Hoc Committees, Staff, USEPA, Other States, Public**
- **Fall-back approach is reference condition-based criteria refined for VA from EPA Region III regional database or VA STORET database updated with 2000 - 2002 monitoring data**

VA Schedule for Adoption of Nutrient Criteria

1. 2005 Chesapeake Bay (*Completed*)
2. 2007 Lakes & Reservoirs (Effective August 14, 2007)
3. 2010 Streams & Rivers
4. TBS Wetlands & Ocean Side of Eastern Shore (*on hold until EPA technical guidance documents available*)

**Regulatory Adoption of Amendments
to the Water Quality Standards Regulation
Takes 18 - 24 Months**

80% of the
state drains
into nutrient-
sensitive
estuaries.

Virginia's Major Drainages

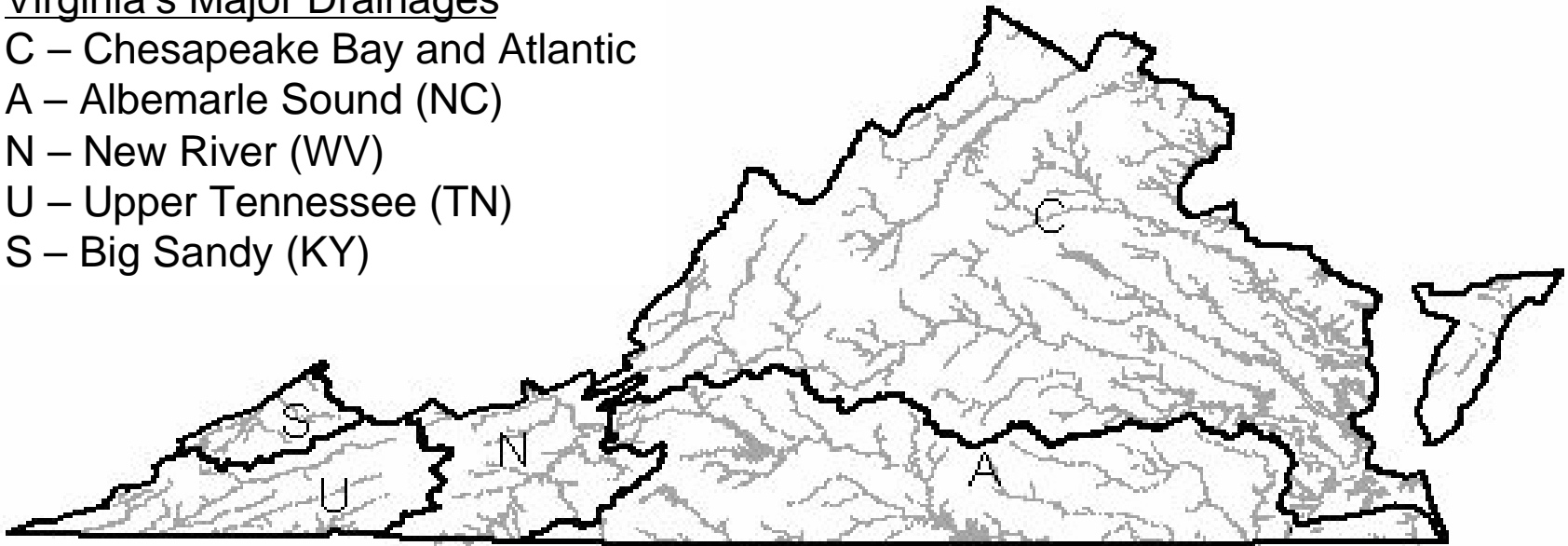
C – Chesapeake Bay and Atlantic

A – Albemarle Sound (NC)

N – New River (WV)

U – Upper Tennessee (TN)

S – Big Sandy (KY)



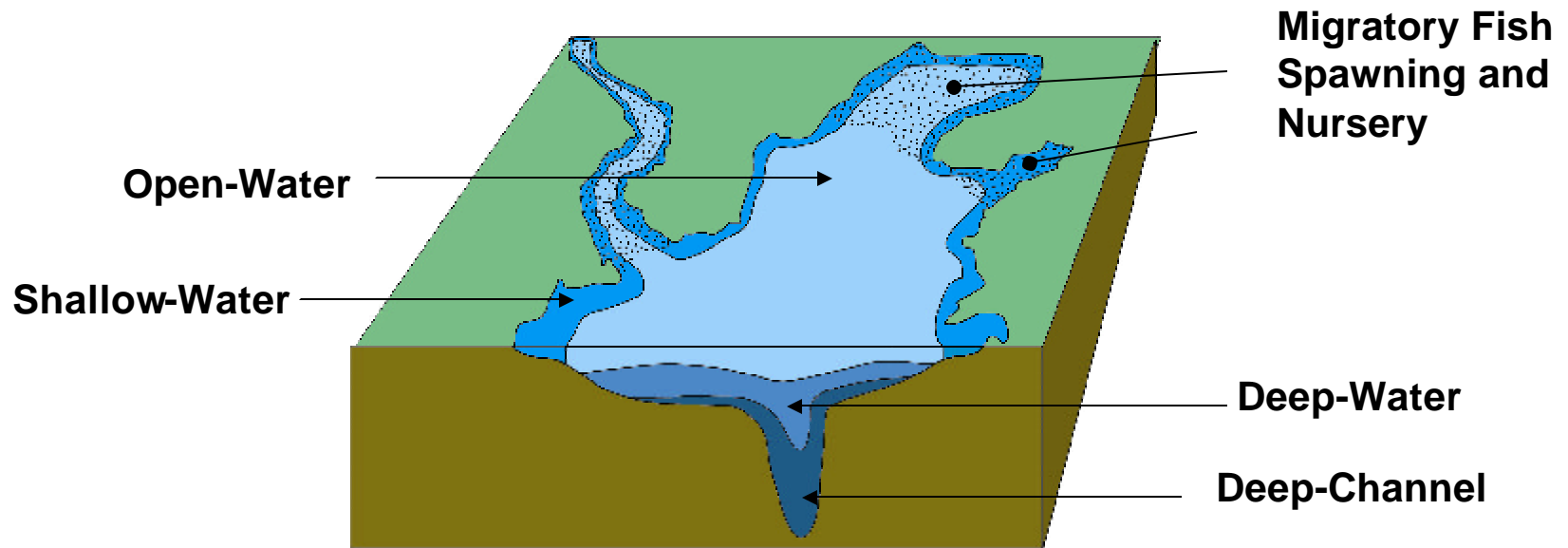
Overall Lessons Learned

- **Utilize effects based approach to criteria development for designated uses rather than EPA suggested criteria**
- **Develop criteria to protect both local & downstream waters**
- **Involve stakeholders throughout reg development process**
- **Collaborate with other states in shared watersheds**
- **Utilize external experts**
 - **EPA Annapolis & others (Chesapeake Bay)**
 - **Academic Advisory Committee (freshwater)**
- **Develop guidance/modify companion regulations (if needed) for assessment, monitoring & permitting**

1. Estuaries

Five Refined Designated Uses

*Criteria for D.O., Chlorophyll, Water Clarity, SAV
Acres*



**Chesapeake Bay and Tidal Tributaries
Completed**

Estuaries

Chesapeake Bay Criteria for Tidal Waters Designated Uses

	Dissolved Oxygen	Chlorophyll	Water Clarity SAV
Migratory Spawning and Nursery	✓		
Shallow Water	✓		✓
Open Water	✓	✓	
Deep Water	✓		
Deep Channel	✓		

Estuaries

James River Site Specific Numerical Chlorophyll *a* Criteria

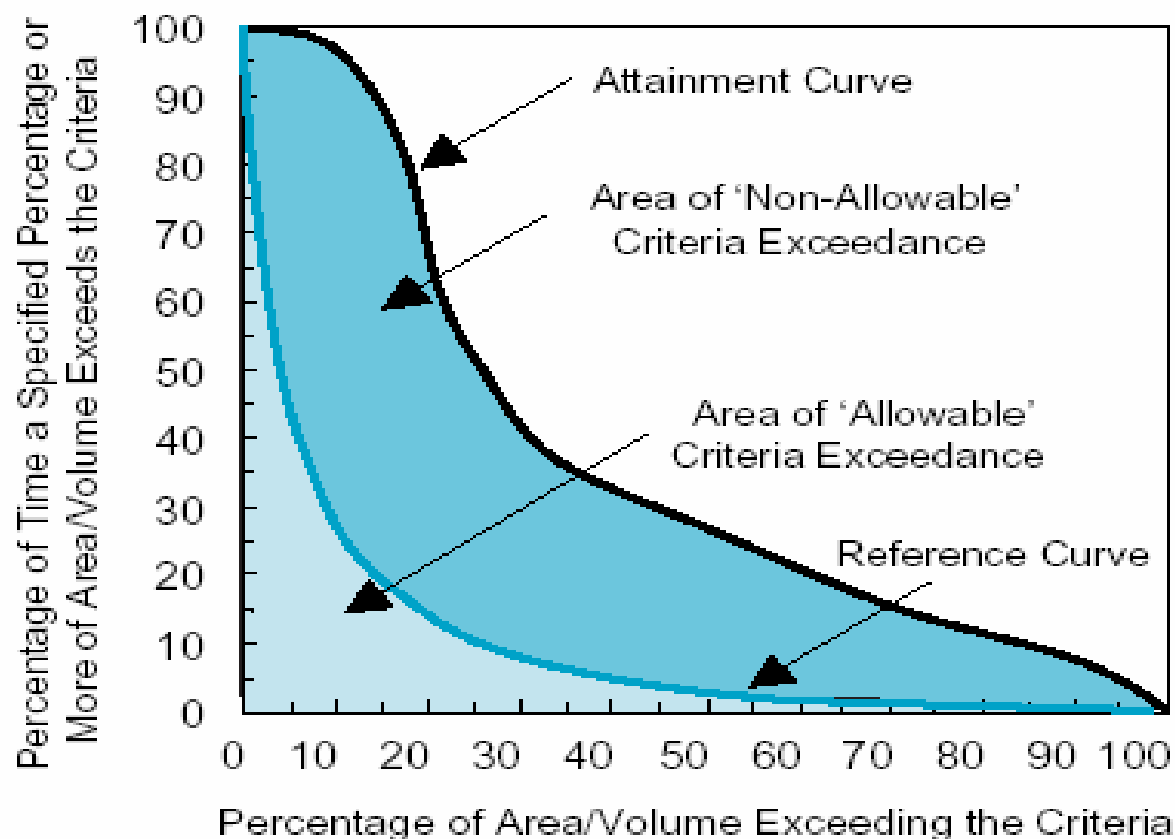
- **Narrative chlorophyll criterion applies to Chesapeake Bay & all tidal tributaries and expected that meeting D.O. criteria will comply with narrative chlorophyll criterion.**
- **Numerical criteria needed to drive nutrient reductions in the James River which is eutrophic but does not experience low dissolved oxygen which is driving reductions elsewhere in the watershed**
- **Criteria based on reference sites, control of nuisance algae & attainability using expected controls for the basin**
- **Values range from 10 -23 $\mu\text{g/l}$ & vary by season (spring, summer) & salinity zone (poly, meso, oligohaline & tidal fresh)**



Estuaries

Implementation

Criteria attainment assessment allows for natural excursions



Estuaries

Implementation

VA Point Source Nutrient Regulations

- **Regulation for Nutrient Enriched Waters and Dischargers within the Chesapeake Bay Watershed (9 Virginia Administrative Code 25-40) contains technology based concentration requirements.**
- **Water Quality Management Planning Regulation (9 VAC 25-720) contains TP and TN loading requirements for significant discharges.**
- **Watershed general permit and point source nutrient credit trading Code of Virginia § 62.1-44.19:12 – 18**
- **All the above include above the fall line loading reductions**

2. Lakes and Reservoirs

Nutrient Water Quality Standards

Adopted 2006/Effective 2007

Recommendations for criteria development came from an Academic Advisory Committee (AAC) formed by the VA Water Resources Research Center & consisted of scientists from several VA colleges & universities:

- Natural lakes & constructed impoundments should be considered separately**
- Protection of designated uses should be the basis for establishing criteria. Recreational fish population status can be an indicator of suitability for aquatic life.**
- Chlorophyll a & total phosphorus recommendations were provided**
- Nitrogen criteria should not be established**

Lakes and Reservoirs

Seasonal (April – October) Numerical Nutrient Criteria for 116 Impoundments* Based on Fishery Type & Ecoregion

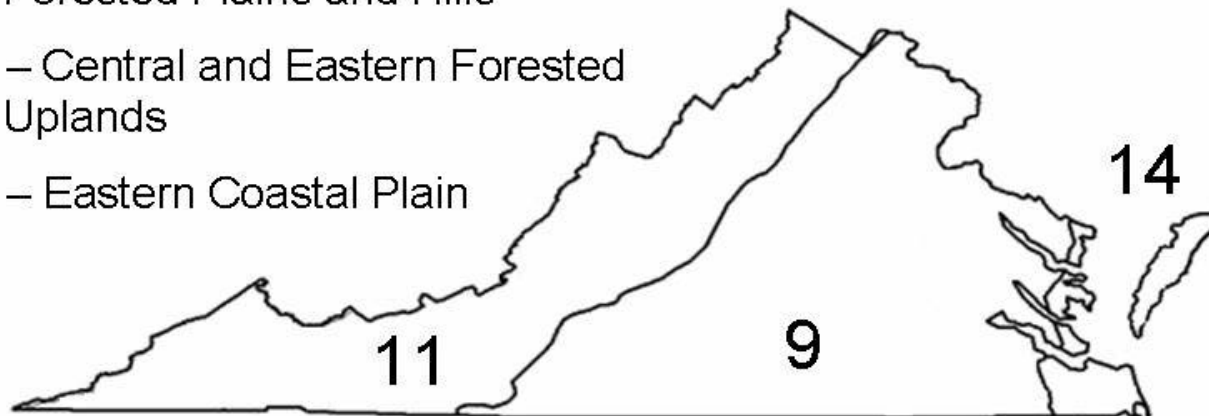
- **Chlorophyll a**
- **Total Phosphorus (when documented use of algicides during the April – November monitoring period)**
- **Dissolved Oxygen (4 mg/l min, 5 mg/l daily average) only for upper layer (epilimnion) during thermal stratification**

*. Publicly accessible lakes > 100 acres in size & publicly accessible water supplies DEQ has previously monitored or plans to monitor

9 - Southeastern Temperate
Forested Plains and Hills

11 – Central and Eastern Forested
Uplands

14 – Eastern Coastal Plain

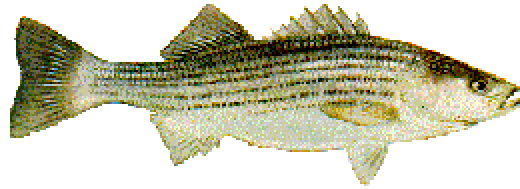


Lakes and Reservoirs

Fisheries Designated Uses

Ecoregion 14

Coolwater Fisheries



Chl-a = 25 ug/L
TP = 20 ug/ l

Warmwater Fisheries



Chl-a = 60 ug/L
TP = 40 ug/ l

Lakes and Reservoirs

Fisheries Designated Uses

Ecoregion 9

Coolwater Fisheries



**Chl-a = 25 ug/L
TP = 30 ug/ l**

Warmwater Fisheries



**Chl-a = 35 ug/L
TP = 40 ug/ l**

Fertilized Lakes



**Chl-a = 60 ug/L
TP = 40 ug/ l**

Lakes and Reservoirs

Fisheries Designated Uses

Ecoregion 11

Coolwater Fisheries



Chl-a = 25 ug/L
TP = 20 ug/ l

Warmwater Fisheries



Chl-a = 35 ug/L
TP = 40 ug/ l

Coldwater Fisheries



Chl-a = 10 ug/L
TP = 10 ug/ l

Lakes and Reservoirs

Special Standards* for the Two Natural Lakes in Virginia

- **Mountain Lake**
(Chlorophyll *a* 6µg/l, ortho-P 8µg/l)
Southwestern Virginia



- **Lake Drummond**
(Chlorophyll *a* 35µg/l, TP 40µg/l)
Great Dismal Swamp Southeastern Virginia



***Based on Natural Background Concentrations**

How the AAC Determined the Maximum Nutrient Concentrations (TP and Chl-a levels) that Sustain Good to Excellent Recreational Fisheries, by Fishery Type and by Ecoregions

- **Historical DEQ database used to identify impoundments with adequate data & retention time for criteria development**
- **Status of recreational fishery in each impoundment rated on a scale of 1 (poor) to 5 (excellent) by VDGIF biologists, in response to requests advanced by Dr. John Ney of the AAC.**
- **Each reservoir was classified as one of the following types based on the professional knowledge of Dr. John Ney and considering VDGIF's biologists' comments during the rating process.**
 - **Coolwater Fisheries**
 - **Coldwater (Trout) Fisheries**
 - **Fertilized Fisheries**
 - **Warmwater Fisheries**
- **Nutrient criteria were statistically derived (median for Chl-a & 90th percentile for TP) by ecoregion & fishery type using lacustrine water chemistry data down to one meter from those reservoirs where the fishery was rated as good or excellent**

Lessons Learned

- **Value of the Academic Advisory Committee**
 - **Role of consultant to DEQ**
 - **Opportunity to explore state specific options**
 - **Recognition from regulated community that the state went the “extra mile” rather than using EPA suggested criteria**
- **Importance of extensive stakeholder (& EPA) involvement**
 - **Ad hoc advisory committee recommendations contributed significantly to the proposed draft regulations**
 - **Active participation in the process contributed to understanding & acceptance of the final amendments**

3. Streams & Rivers

Nutrient Standards

Under Development



Academic Advisory Committee recommends:

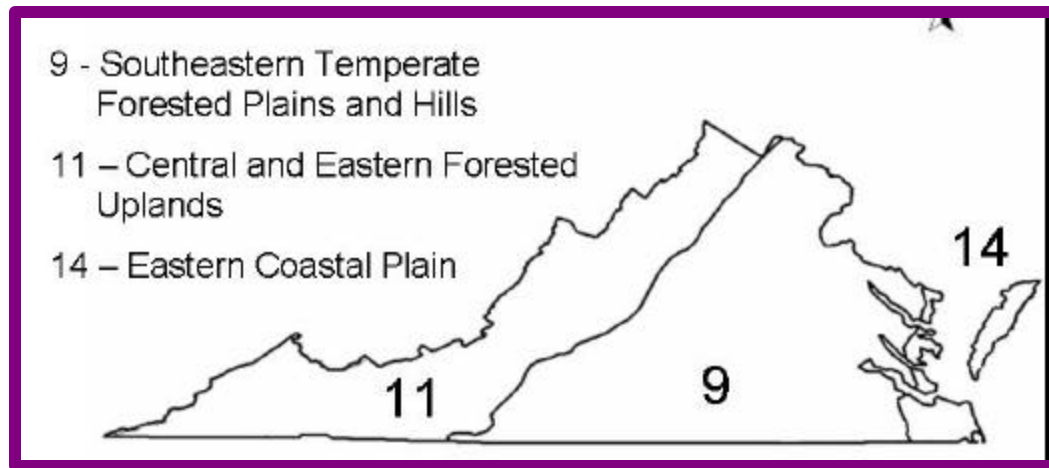
- **Two major components to criteria development approach:**
 - **Criteria to protect individual stream segments from impairment (localized component)**
 - **Criteria to be applied only in stream segments that contribute nutrients to nutrient-impaired downstream waters (downstream-loading component) and expressed as narrative criterion until criteria available from downstream states**
- **Initial recommendation that periphyton in wadeable streams & plankton in non-wadeable streams should be considered as the primary indicators of use suitability (but rather than incur expense of starting a new state algae program, currently exploring use of a weight of evidence screening value approach in wadeable streams & fish in non-wadeable streams and rivers)**

EPA Funding

***A Weight of Evidence Screening Value Approach to
Nutrient Criteria Development for Wadeable Streams***

in Aggregate Nutrient Ecoregions IX and XI:

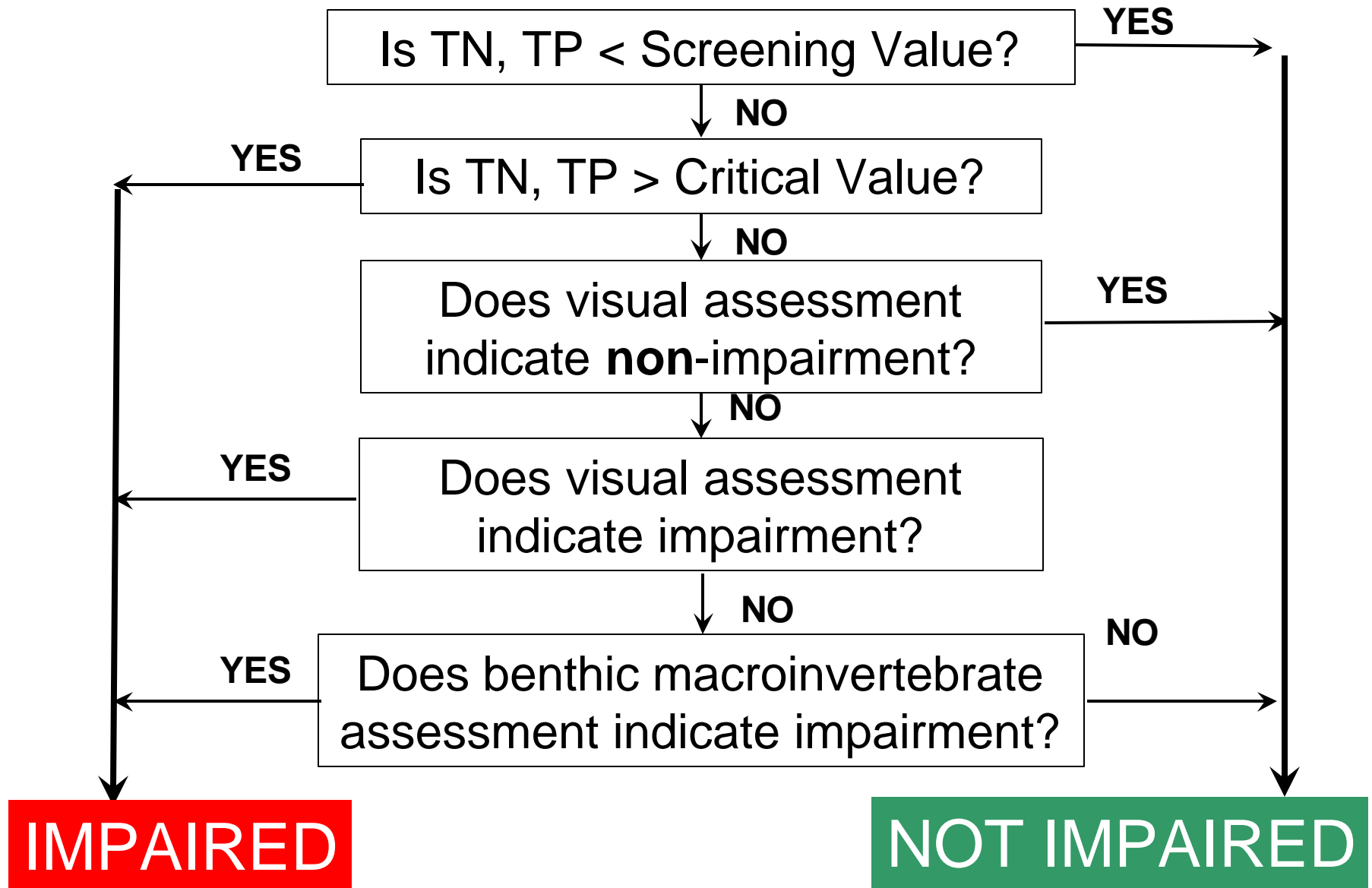
Proposed Pilot Program in Virginia



Pilot program purpose: Evaluate the ability of a nutrient criteria screening-value approach to achieve its intended goals:

- Scientific and legally defensible criteria that will protect water quality.
- Can be implemented by DEQ with available resources.

Proposed Screening Value Approach



Anticipated Outcomes / Benefits of Pilot Program

Determine feasibility of screening-value (SV) approach to nutrient criteria.

- Would such an approach result in fewer assessment errors than “fixed threshold” criteria?
- If so: How much better is it? And at what cost?

If SV approach is feasible: pilot program results can

- Aid definition of “screening value” and “critical value” nutrient concentrations.
- Aid definition and interpretation of “visual assessment” protocol

If SV approach is *not* feasible, results can help develop “fall back” position, such as fixed criteria.

Lessons Learned to Date

- Design a one day or less field assessment approach that allows assessments at many stations
- Involve regional biologists in project planning for technical expertise and check on what realistically can be done at a station
 - Eliminated diurnal DO measurements due to limited access to equipment and need for repeat visit to station site to maintain/remove equipment
 - Utilized where possible check off format on visual assessment sheet